

# Hawke's Bay orchard surveys after cyclone Gabrielle

Version 1: 10 March 2023

Plant & Food Research, AgFirst, Fruition, NZAPI, Fruitfed, Horticulture,  
Farmlands



# What was done?

- Surveyed ~30 orchards around the Hastings region 15 and 16 days after the cyclone,

We measured:

- Height of sediment
- Presence of gleying in the sediment
- Presence of gleying in the original soil
- Depth to water table
- Assess tree health
- Drain health
- Blocks with >30 cm of silt were not assessed



# What we typically found

- A fine textured layer (silt + clay) on the soil surface (10 to >250 mm thick)
- The sediment was still saturated, with consistency ranging from mousse to soup
- The sediment was gleyed, beginning at the original soil surface where the grass was rotting.
- The original soil beneath the sediment appeared unaffected
- The tree leaves were unaffected, but the fruit that had been submerged was soft and dropping
- The water table was 250 to >700 mm below the original soil surface







# Where the sediment was sandy

- The sediment had drained
- The original soil was gleyed in patches, beginning from the soil surface where roots and organic matter were decaying
- The leaves were healthy, but the fruit were soft and dropping



# Tip death at one orchard

- Leaf tips had died, but trees seemed otherwise okay at this point



# What if you do nothing to the sediment layer?

## Best case scenario

- The sediment dries
- Worms create air channels
- Will still have problems with weeds germinating in the sediment, low fertility, trafficking problems on clay, poor water infiltration, scion rooting where sediment covers the graft union.

## Worst case scenario

- The sediment is very slow to drain or we get more rain
- Trees run out of air
- Root rots set in
- Tree death



# What to do about it immediately? – see attached flow diagram

- The first question is “Is the block worth saving?”
- If potentially yes, then “Is the sediment above the graft union?”
- If it is, all the sediment will need to be removed (at some stage) to below the graft union to avoid scion rooting. Clearing the silt from only around the trunk is unlikely to work well long term, as this will direct runoff to each tree trunk, creating waterlogging around each tree.
- If the sediment has drained already, the risk of tree loss is greatly reduced, if not, can shallow drains be pulled in the sediment to enhance drainage, or can sumps be dug that can be pumped?

# What to do once the sediment is dry?

- Once dry, the sediment (particularly clays) will need to be cultivated into the original soil to minimise ongoing issues with poor infiltration.
- Soil test to 15cm depth, then get fertiliser recommendation.
- Harrow in recommended fertiliser.
- Sow grass with roller drill at a high seeding rate
- Apply N at 30 kg/ha after 4-6 weeks. (Understorey may need further N applied, but also consider tree N status)

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# Silt/sediment testing to date

## pH

- High in all samples in a range of 7.9 to 8.1

## CEC & Volume Weight

- Esk =                    CEC = 18                    VW = 1.17
- Dartmoor                CEC = 26                    VW = 1.1
- Twyford                 CEC = 19                    VW = 0.98
- Pakowhai                CEC = 30                    VW = 0.83

A variation across the samples and variation will be found in the larger sampling about to be done. These samples were taken from the lower part of each catchment. You will find sandier sediments where the water was actively flowing and more clay/silt where water was flow slowly and pooling.

## Phosphorus

- Low in Esk and Dartmoore
- Moderately low in Twyford and Pakowhai

# Silt/sediment testing to date

## Potassium

- Low in Esk and Dartmoore
- Moderately low in Twyford
- Reasonable levels found in Pakowhai

## Calcium

- High in all samples with the base saturation of calcium being in the range of 94 to 87% - which is massive. Contrary to popular interpretation, very high calcium is not great for soil structure.
- No applications of lime or gypsum until the soil remediation processes is complete and soil has been tested

## Nitrogen & Organic Matter

- Low in Esk
- Moderately low in Dartmoore
- Higher than expected in Twyford and especially Pakowhai

The clay anaerobic nature of Pakowhai in combination with significant OM and N is what is making it smelly. This needs aerating and then the soil medium should be able to support growth of plants. The texture, aeration (lack of) and water infiltration is potentially the issue. This type of texture is what settles from water that is not flowing, basically a muddy lake.

# Silt/sediment testing to date

## Multiresidue Pesticides & Heavy Metals Screens

- This is only a small sample size and the larger testing process will give better validation but hopefully this gives us some confidence that the silt material is not a slushy pool of chemicals that is going to poison the soil for years to come. This is not unexpected as testing like this has been done following other flooding events and the volume of water passing through will dilute any product well below any level of detection or level that would cause the environment any concern.
- Those growers with contaminated spray sheds need to get these cleaned up ASAP to prevent any further contamination. Horticulture have a collection point for these.

# Other areas under consideration

- When and what to include in the soil test – post cultivation with a mix of old top soil and sediment
- Best understory to replant – under consideration